Journal of Low Temperature Physics 2016 vol.182 N1-2, pages 28-37

Structural Transitions in a Quasi-1D Wigner Solid on Liquid Helium

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Abstract

© 2015, Springer Science+Business Media New York.We present a detailed study of structural transitions of an electron system on liquid helium in quasi-1D confinement geometry. The structural transitions are experimentally observed as current oscillations in transport measurements with changing electrostatic confinement parameters. Finite element modelling and Monte Carlo simulations were used to investigate the electron configuration. With increasing electron density, the single chain of electrons splits into a two-, three- and so on row configuration. A proliferation of defects accompanies each structural transition. We find a good agreement between the observed current modulation and the evolution of the electron row configuration predicted by our calculations.

http://dx.doi.org/10.1007/s10909-015-1344-4

Keywords

Electrons, Finite-element modelling, Helium surface, Microchannels, Monte Carlo, Quasi-one dimensional